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# title: Block Builders

## Builder Fundamentals

### What is a Builder?

Block builders are highly specialized actors who construct blocks from transaction orderflow (public transactions, bundles, private transactions, etc).

### The Role of Builders

Builders run algorithms and simulations (e.g. First Come First Serve, First Price Auctions, etc.) to order bundles and TXs in a block template (technically: `execution payload`) that maximizes profit. Builders then bid for and buy the validators' blockspace, facilitated by one or more relays, so their execution payloads are proposed to the blockchain.

### How do builders pay block proposers?

Flashbots proposed a standardized specification for how payments are made from builders to block proposers through the following process:

1. The builder sets their own address as the `feeRecipient` of the payload block header they are constructing.
2. The builder includes a transaction which pays ETH to the proposer's `feeRecipient` address at the end of their proposed block.

### Determining the value of blocks

A standard method for determining block value is crucial for multiple components of the MEV-Boost ecosystem; including relay monitoring, validator accounting, builder payments, block explorers, payment proofs, and MEV hiding.

Various methods for defining block value were [considered](#) by members of the community. It was determined that block level scoring was the most simple and intuitive method for scoring block value.

### Block level scoring

Block level scoring looks at the difference in the balance of the fee recipient account before and after the block execution.

Note that a "block score" is not meant to be a formal definition of realized extractable value, since this is a difficult metric to quantify. For example, a Layer 2 transfer to a validator' fee recipient address could be considered extractable value, but falls outside the scope of a block score calculation.

Constructing a payment proof for this scoring method requires a Merkle Proof of the fee recipient balance in block  $(n - 1)$ , and a Merkle Proof of the fee recipient balance in block  $n$ . **Payment proofs have not yet been put into production.** Active discussion about payment proof implementation is still on-going. For more details or to participate in the discussion around payment proofs and block-level scoring, please check out to the [block scoring](#) forum thread.

## External Builders

External builders can submit blocks to Mainnet, Goerli and Sepolia Flashbots relays. The table below outlines Builder API methods available on each network.

### Relay Block Submission Endpoints by Network

	Mainnet	Goerli	Sepolia
<code>getValidators</code>	GET Request - Returns an array of validator registrations with assigned duties in the current and next epoch		
<code>submitBlock</code>	POST Request - submits a block to the relay		

- See also the [Relay API documentation - Block Builder API](#) for more details on the API and payloads.
- The example [Flashbots builder implementation](#) is a good external builder reference, and is currently used in production by several builders.

### Rate-limits

Submissions to all relays are currently rate-limited to 600 submissions / 5m / IP, which translates to in average 2 submissions / sec / IP.

## Flashbots Builders

All Flashbots builders pay block proposers from the [flashbots-builder.eth ENS address](#). Each Flashbots builder uses a different public

key (builder\_pubkey) for relay identification and analytics purposes.

The various builder\_pubkeys used to identify Flashbots builders to relays are listed below:

```
| Builder Public Key | | ----- | |
0x81babeec8c9f2bb9c329fd8a3b176032fe0ab5f3b92a3f44d4575a231c7bd9c31d10b6328ef68ed1e8c02a3dbc8e80f9 | |
0x81beef03aafd3dd33ffd7deb337407142c80fea2690e5b3190cfc01bde5753f28982a7857c96172a75a234cb7bcb994f | |
0xa1dead01e65f0a0eee7b5170223f20c8f0cbf122eac3324d61afbdb33a8885ff8cab2ef514ac2c7698ae0d6289ef27fc | |
0xa1defa73d675983a6972e8686360022c1ebc73395067dd1908f7ac76a526a19ac75e4f03ccab6788c54fdb81ff84fc1b | |
0x81babad2d5fd9413c942f49bfd86bc1dca5b02ff4cd065a10c7ab05713e63883056e6a87777e236424574aa25bbe3e99 | |
0xb89b9308fbc6c2998c7e60e39424b858c74b02c234b3e0fa5ecf7c3971208dfa5f92e0bdbbe16fc24abfd71c248acf0f9 | |
0xa1f1a5a4970903afd6f0f16049c3e9997d348a3254e99b08e89ffb553d0b1575595776b1d849ca2e8d64106443a47e76 |
```

## Additional Links & References

- [MEV-Boost Geth Builder](#) - an example builder implementation
- [Relay API documentation - Block Builder API](#)
- Block Builder Self-Help Group: <https://collective.flashbots.net/c/builders/14>
- Github issue about becoming block builder: <https://github.com/flashbots/mev-boost/issues/145>.
- [Mevboost.org\\*](#) - Tracking MEV-Boost relays and block builders. A quick hack by [Anish](#). Design inspired by file.app.

*Note: Flashbots does not control and cannot verify the data coming from external people and organizations. Please direct questions or issues directly to the creators of external data sources.*